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PATENT

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of

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for

VARIABLY CURVED TRACK-MOUNTED AMUSEMENT RIDE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This is a continuation-in-part of copending U. S. application Serial No. 10/262,327, filed on 10/01/2002.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention relates to an amusement ride that has both inside and outside substantially vertical curves shaped to optimize the number of curves which can be included within a given vertical space.

Description of the Related Art

[0003] United States patent number 5,791,254, deals primarily with a cart which, according to lines 66 through 67 in column 5 of the patent, provides participants with the ability to rotate their seating about one or more axes of the cart. Such patent further provides, lines 7 through 9 in column 9, "FIG. 13 illustrates a complex roller coaster having multiple configurations, including . . . a horizontal 'plumber's drain' 82"

[0004] The description of the "complex roller coaster" is extremely general. No details of the construction are given other than the basic shape. There is no indication that any brakes exist to control the speed of the cart through the turns. The segments between the curves of the "plumber's drain 82" appear to be equidistant from one another and completely horizontal. And no discussion occurs about any wheels or how they can be serviced while the cart remains in the type of track necessary to permit the body of the cart to be either above or below the track.

BRIEF SUMMARY OF THE INVENTION

[0005] Critical to an understanding of the present invention are the terms "inside curve" and "outside curve."

[0006] Figure 1 illustrates a general curve (1) in which lines (2) have been drawn that are perpendicular to the curve (1).

[0007] On a first side (3) of the curve (1), the lines (2) tend to diverge from one another as such lines (2) extend farther from the curve (1). On a second side (4) of the curve (1), the lines

(2) tend initially, *i.e.*, before any of the lines (2) cross one another, to converge toward one another as such lines (2) extend farther from the curve (1).

[0008] When the wheels (5) of a cart (6) follow the curve (1), the curve (1) is termed an outside curve if the body (7) of the cart (6) is on the first side (3) of the curve (1) and an inside curve if the body (7) of the cart (6) is on the second side (4) of the curve (1).

[0009] In a first embodiment, the track has both inside and outside curves where the curves lie substantially within a vertical plane and where the axis of symmetry for the curves is substantially horizontal. Furthermore, the track can retain the cart no matter what the orientation of the body of the car is with respect to the track. Brakes, which can be friction brakes or magnetic brakes, are preferably, but not necessarily, installed in the curves in order to control the speed of the cart through the curves. Substantially horizontal track segments preferably, but not necessarily, connect the curves; such substantially horizontal track segments are spaced farther apart where the body of the cart is to be between such segments than are segments which will not have the body of the cart between them, thereby enabling more curves to be placed within a given vertical space. Additionally, the substantially horizontal track segments are preferably, but not necessarily, slanted downward in the intended direction of travel to facilitate continued movement of the cart. And, also preferably but not necessarily, the track can be opened to service or replace wheels on the cart while the wheels remain in the track.

[0010] A second embodiment is similar to the first with the exception at least the farthest outside portion, and preferably the entire curve, of each outside curve has no track directly below it. Optionally, though, the lowest level of track can be below one or more of the outside curves. And, preferably with this second embodiment, all the curves are outside curves since the track rolls to invert its orientation after every outside curve.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0011] Figure 1 illustrates a general curve.

[0012] Figure 2 is a lateral view of a first embodiment for the Variably Curved Track-mounted Amusement Ride.

[0013] Figure 3 is a cross-sectional view of a first embodiment for the track.

[0014] Figure 4 is a cross-sectional view of an alternate embodiment for the track.

[0015] Figure 5 illustrates a portion of the track which has been opened.

[0016] Figure 6 shows a portion of the track which contains an aperture for servicing or replacing wheels of the cart.

[0017] Figure 7 is a cross-sectional view of a still further embodiment for the track.

[0018] Figure 8 is a lateral view of a second embodiment for the Variably Curved Track-mounted Amusement Ride.

[0019] Figure 9 is a plan view of the second embodiment for the Variably Curved Track-mounted Amusement Ride.

[0020] Figure 10 is a lateral view similar of an embodiment that is the same as that of Figure 8 with the exception that only outside curves are present.

DETAILED DESCRIPTION OF THE INVENTION

[0021] The Variably Curved Track-mounted Amusement Ride has, as illustrated in Figure 2, a track with at least one outside curve (8) and one inside curve (9) on which rides a cart (6) having wheels (5), a body (7), and any restraint (10) for one or more passengers that is well known in the art and that will prevent a passenger from leaving the cart (6) even when the cart is inverted. Preferably, the restraint (10) is that which is the subject of United States patent application no. 10/244491, which was filed on September 16, 2002.

[0022] The curves (8), (9) lie substantially within a vertical plane; and each curve (8), (9) has an axis of symmetry (11) which is substantially horizontal.

[0023] Preferably, in a first embodiment, outside curves (8) alternate with inside curves (9). Also preferably, as portrayed in Figure 2, before the first curve (8), (9), between each outside curve (8) and each inside curve (9), and after the last curve (8), (9) is a substantially straight segment (12). Of course, since such a substantially straight segment (12) is preferred, it need not be present.

[0024] Outside curves (8) have a beginning (13) and an end (14); similarly inside curves (9) have a beginning (15) and an end (16). The beginning (13) and end (14) of an outside curve (8) are vertically closer to each other than are the beginning (15) and end (16) of an inside curve (9) since, unlike an outside curve (8), an inside curve (9) must accommodate the body (7) of a cart (6) which travels upon the track (17). Decreasing the distance between the beginning (15) and

end (16) of an inside curve (9) enables more curves (8), (9) to be placed within a given vertical distance.

[0025] The curve (8), (9) that is above all other curves (8), (9) is termed the “first curve” and, in the first embodiment, can be either an outside curve (8) or an inside curve (9), although it is preferable, but not necessary in the first embodiment, to have an outside curve (8) above all other curves (8), (9).

[0026] Preferably, each substantially straight segment (12) slopes downward from a first end (18) to a second end (19), *i.e.*, in the intended direction of travel. This facilitates movement of the cart (6). Of course, since this is merely a preference, any substantially straight segment (12) may have other variations in height.

[0027] The track (17) is any type of track (17) that is well known in the art for being capable of retaining the cart (6) no matter what the orientation of the body (7) of the cart (6) is with respect to the track (17). Examples of such a track (17) are opposing C-channels (20) with the longitudinally open portion (21) of each such C-channels (20) being oriented toward the longitudinally open portion (21) of the other such C-channel (20), as illustrated in Figure 3, and opposing tubes (22), each tube (22) having a continuous longitudinal slot (23) oriented toward the other tube (22). Within the tubes (22) side wheels (24), preferably, and load wheels (25) are employed, as illustrated in Figure 4. Additionally, the track (17) can preferably, but not necessarily, be opened to service or replace wheels (5) on the cart (6). This can be accomplished either by having a hinged section (26) that can be rotated and, preferably, locked with a lock (27), as shown in Figure 5 using one of the opposing C-channels (20) as an example, or by simply having an aperture (28) in a portion of the track (17) that will never have to support the weight of the cart (6), as illustrated in Figure 6 again using one of the opposing C-channels (20) as an example.

[0028] A further example of an acceptable track (17) is, as illustrated in Figure 7, any structure (29) having a top (30), bottom (31), and interior side (32). In such an example, two structures (29) are used substantially parallel to each other. With each such structure (29), the cart (6) employs, attached to the cart (6), load wheels (25) that run on the top (30) and the bottom (31) of the track as well as side wheels (24) which run on the interior side (32).

[0029] The cart (6) can be raised to the beginning (33) of the track (17) through any means (34) that is well known in the art. A non-exclusive list of examples for the cart-raising means (34) includes a chain drive; electrical induction motors; and a gas-powered cylinder such as those described in United States patent no. 6,176,788; and an elevator, preferably an elevator having more than one cart container with each such container following a rotary path. Of course, track (17) is used either in, and as part of, an elevator or, as part of the other types of cart-raising means (34), running from the second end (19) of the straight segment (12) after the last curve (8), (9) to the beginning (33).

[0030] After having been raised to the beginning (33) of the track (17), the cart (6) proceeds downward through the curves (8), (9). After having gone through all the curves (8), (9), the cart is again ready to be raised to the beginning (33) of the track (17).

[0031] At least one curve (8), (9) and, preferably, each curve (8), (9) contains a brake (35), preferably an adjustable brake, for controlling the speed of the cart (6). Preferably, any sensor (36), preferably a speed sensor, that is well known in the art for measuring a factor which is determinative of the speed of a body being subjected to a decelerative force while descending under the influence of gravity measures such factor, preferably speed, in relation to the cart (6) and communicates such factor, preferably speed, to a computer control system (37) which is capable of being programmed with the desired speed for the cart (6); which is capable of being programmed with data indicating the initial force being applied by the adjustable brake (35) and what electrical signal from the computer control system (37) will produce what adjustment to the force generated by the adjustable brake (35); which is programmed to store in its memory and recall any signals that have been sent to the adjustable brake (35) to adjust the force the adjustable brake (35) is applying; and which is also capable of and programmed to determine, after having been programmed with a desired speed for the cart (6) and after having received the measurement from the sensor (36), the force for the adjustable brake (35) to apply so that the cart (6) will attain the desired speed. Having been programmed with data indicating the initial force being applied by the adjustable brake (35) and what electrical signal from the computer control system (37) will produce what adjustment to the force produced by the adjustable brake (35), the computer control system (37) determines the electrical signal that will cause the adjustable brake (35) to adjust the force it is applying in order to produce the force that will achieve the desired

speed and communicates the appropriate electrical signal to the adjustable brake (35). Of course, after any such signal has been sent by the computer control system (37), such signal is recalled and utilized in determining any subsequent adjustment. (Another example of a factor which is determinative of speed under these circumstance is the weight or mass of the body being decelerated since the decelerative force must be proportional to such weight or mass.)

[0032] The brake (35) can be any brake that is well known in the art, such as a friction brake or a magnetic brake. The friction brake applies more force by pushing harder—through any means that is well known in the art, such as a pneumatic cylinder—against a plate (38) on the cart (6); the magnetic brake applies more force by having more current run through the brake (35).

[0033] A second embodiment is, as indicated above, the same as the first embodiment except that, as illustrated in Figure 8 and Figure 9, at least the farthest outside portion (39), and preferably the entire curve, of each outside curve (8) has no portion of track (17) directly below it, although optionally the lowest level (40) of track can be below one or more of the outside curves (8). Moreover, preferably, as depicted in Figure 10, all the curves of the second embodiment are outside curves (8) because the track (17) rolls to invert its orientation after every outside curve (8). Thus, a participant facing forward in the cart (6) will have an unobstructed view downward as the cart (6) goes over an outside curve (8).

[0034] As used herein the term “preferable” or “preferably” means that a specified element or technique is more acceptable than another but not that such specified element or technique is a necessity.